CLAIMS

We claim:

1. A high energy DF chemical laser gain generator, comprising:

a combustor for generating atomic fluorine (F), including a plurality of combustor injectors, for injecting into the combustor a gas containing fluorine and hydrocarbon fuel;

a laser cavity in which lasing takes place as a result of a chemical reaction between the atomic fluorine (F) and deuterium (D_2); and

a plurality of laser cavity injector blades, for injecting deuterium (D_2) with the atomic fluorine into the laser cavity;

wherein the laser cavity injector blades include internal passages for flow of cooling water;

and wherein the gain generator is formed from a plurality of thin platelets of metal in which all required internal passages for flow of cooling water and gases are formed by chemical etching of each platelet separately;

whereby the water-cooled laser gain generator operates at relatively low temperatures and avoids the need for high gas inlet pressures.

2. A high energy DF chemical laser gain generator as defined in claim 1, wherein all of the platelets forming the laser gain generator are of a high strength alloy having sufficient strength to avoid the need for supporting structures within the gain generator.

3. A high energy DF chemical laser gain generator as defined in claim 2, wherein the high strength alloy is selected from the group consisting of Inconel 718 alloy, Inco 600, Haynes alloy L605, and Waspaloy.

4. A high energy HF chemical laser gain generator, comprising:

a combustor for generating atomic fluorine (F), including a plurality of combustor injectors, for injecting into the combustor a gas containing fluorine and deuterium (D_2);

a laser cavity in which lasing takes place as a result of a chemical reaction between the atomic fluorine (F) and deuterium (D_2); and

a plurality of laser cavity injector blades, for injecting deuterium (D_2) or H_2 with the atomic fluorine into the laser cavity;

wherein the laser cavity injector blades include internal passages for flow of cooling water;

and wherein the gain generator is formed from a plurality of thin platelets of metal in which all required internal passages for flow of cooling water and gases are formed by chemical etching of each platelet separately;

whereby the water-cooled laser gain generator operates at relatively low and uniform temperatures and avoids the need for high gas inlet pressures.

5. A high energy HF chemical laser gain generator as defined in claim 4, wherein all of the platelets forming the laser gain generator are of a high strength alloy having sufficient strength to avoid the need for supporting structures within the gain generator.

6. A high energy HF chemical laser gain generator as defined in claim 5, wherein the high strength alloy is selected from the group consisting of Inconel 718 alloy, Inco 600, Haynes allow L605, and Waspaloy.

7. A method for fabricating a high energy DF or HF chemical laser gain generator, comprising the steps of:

separately etching each of a plurality of thin metal platelets, to define successive cross sections of a laser gain generator that includes a plurality of laser cavity injector blades with gas passages for the injection of fluorine and deuterium gases, and water passages for the flow of cooling water;

stacking the etched metal platelets in alignment to form the laser gain generator; and

applying heat and pressure to the stacked metal platelets, to fuse them together by diffusion bonding;

whereby the water cooling passages permit the laser gain generator to be operated at a relatively low and uniform temperature.

8. A method as defined in claim 7, wherein the metal platelets are of a high-strength nickel alloy.

9. A method as defined in claim 7, wherein the step of separately etching includes forming cross-sectional slices of a plurality of water cooling passages within each of a plurality of cavity injector blades in the laser gain generator.